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ABSTRACT:

PROBLEM TO BE SOLVED: To solve a problem that it is very difficult for a user who has generated a program with a motion language to generate a program executed for fixed-cycle processing of a ladder diagram or the like.

SOLUTION: This programming device 1 for the programmable controller 2 which executes a program such as a ladder diagram in fixed cycles is equipped with a motion language display editing operation means 22 which displays and edits the motion language of the program executed in instruction steps, a converting function means 24 for conversion from the motion language to the ladder diagram having a control means which interprets input/output data sent from the means 22, converts the motion language into a language of the program executed in fixed cycles such as the ladder diagram that the controller 2 has, transfers the program to the controller 2, and reads and writes a user memory with the controller 2, and a program data storing function means 23 which has a storage area where the edited program is stored and the converted program is stored.

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CLAIMS

[Claim(s)]

[Claim 1] Programming equipment of the programmable controller which performs programs, such as a ladder diagram, to a fixed cycle, and has a motor control functional means and user memory characterized by providing the following. A motion language display editing operation means to display the motion language with which a program is performed by the instruction step, and to edit. The I / O data sent from the aforementioned motion language display editing operation means is interpreted, it changes into the language with which a program is performed by fixed cycles, such as a ladder diagram which the aforementioned programmable controller has, from the aforementioned motion language, the aforementioned program is transmitted to the aforementioned programmable controller, and it has the control means carried out in read-out of the aforementioned programmable controller and the aforementioned user memory and writing, and is a conversion functional means from a motion language to a ladder diagram. A program data storage functional means to have the storage region which memorizes the edited aforementioned program, and the storage region which memorizes the changed program.

[Claim 2] The aforementioned I / O data is programming equipment of the programmable controller according to claim 1 characterized by consisting of the I/O data format which consists of Data ID, an instruction type, Instruction ID and data size, and data.

[Claim 3] It is programming equipment of the programmable controller according to claim 2 characterized for the aforementioned program data being a format which consists of the structure of the instruction N made into instruction 0 or the natural number N, and the aforementioned instruction data being a format which consists of Data ID, an instruction number, data size, and the structure of data by things.

[Claim 4] Programming equipment of a programmable controller according to claim 3 characterized by providing the following. The conversion functional means from the aforementioned motion language to a ladder diagram is the I / O data interpretation function to interpret the received aforementioned I / O data by the aforementioned instruction ID, and to perform processing corresponding to [in the program data interpretation function and the programmable controller / based on the interpreted data] data to the user memory I/O function of a ladder program write-in function and a programmable controller. The program data interpretation function in which perform by the aforementioned I / O data interpretation function when the aforementioned instruction ID is program compilation, read specification program data from the aforementioned program data storage functional means, make the conversion function from the aforementioned motion language to a ladder diagram perform ladder diagram transform processing, and the data is made to store in the aforementioned program data storage functional means. It is a ladder program write-in function to the programmable controller which performs by the aforementioned I / O data interpretation function when the aforementioned instruction ID is program download, reads specification program data from the aforementioned program data storage functional means, and is performed in the beginning of a ladder program to the aforementioned programmable controller. The program controller and the user memory I/O function in which I/O of the aforementioned program controller and the aforementioned user memory is performed by the aforementioned I / O data interpretation function when the aforementioned instructions ID are a program data light and program counter reset.

[Claim 5] Programming equipment of a programmable controller according to claim 4 characterized by providing the following. The structure of the ladder diagram after compile of the conversion function from the aforementioned motion language to a ladder diagram is motion data processing to which processing set in order to be in the 1st of periodic processing and to use the data of a servo control etc. by the next motion control processing is carried out. 1st motion control processing which performs processing which creates the data used by the ladder diagram of the compile result of the motion language program which is in the 2nd of periodic processing and users, such as a position, a speed detection, etc. symmetrical with control from the aforementioned motion data processing, created, and the further motion control processing. It is the ladder diagram by which it is in the 3rd of periodic processing, sets of two or more instructions surrounded considering the program counter as conditional statement are consisted of, only the instruction of the value of a program counter is executed at the time of execution, and processing of the same program counter is performed ranging over a period until execution is completed. Motion data output processing which is in the 4th of periodic processing, is in the 5th of the 2nd motion control processing which creates the aforementioned user data outputted to the aforementioned servo control which performs actual motion control, and periodic processing, and outputs required motion data to the aforementioned servo control based on the execution data of motion control processing of the above 2nd.

[Claim 6] The diagram of the compile result of the aforementioned motion language program which the aforementioned user created The ladder as which it consists of meetings of a block of the ladder program which surrounded the aforementioned

program counter by the conditional expression which consists of conditional statement, and the ladder program in the aforementioned conditional expression expresses a part for each instruction for each aforementioned program counter. It is programming equipment of the programmable controller according to claim 5 which will be characterized by making it the aforementioned program counter change to the next instruction if it consists of conditional statement which supervises completion of an instruction and completion of an instruction becomes truly.

[Claim 7] It has a motor control functional means and user memory. by and the aforementioned motion language display editing operation means Perform programs, such as a ladder diagram, to a fixed cycle, and it sets for the conversion functional means from a motion language to a ladder diagram. If the motion language with which a program is performed is displayed and edited by the instruction step The I / O data sent from the aforementioned motion language display editing operation means is interpreted. It changes into the language with which a program is performed by fixed cycles, such as a ladder diagram which the aforementioned programmable controller has, from the aforementioned motion language. The programming method of the programmable controller characterized by what the aforementioned program is transmitted to the aforementioned programmable controller, and read-out of the aforementioned programmable controller and the aforementioned user memory and write-in control are performed for.

[Claim 8] The aforementioned motion language editing operation function publishes an instruction by the I/O data format specified to the conversion function from the aforementioned motion language to a ladder diagram. The conversion function from the aforementioned motion language to a ladder diagram It attaches for interpreting the I / O data of the specified I/O data format. the aforementioned I / O data interpretation function Interpret the received aforementioned I / O data by the aforementioned instruction ID, and if the instruction ID of the aforementioned data is a program compilation demand, the aforementioned program data interpretation function When the aforementioned instruction ID is program compilation, it performs by the I / O data interpretation function. the aforementioned program data interpretation function Specification program data are read from the aforementioned program data storage function. The conversion function from the aforementioned motion language to a ladder diagram is made to perform ladder program transformation processing. the conversion function from the aforementioned motion language to a ladder diagram The programming method of the programmable controller according to claim 6 characterized by changing into a separate ladder program for every aforementioned instruction ID, and storing the data in the aforementioned program data storage function based on a program data structure format.

[Claim 9] The aforementioned motion language editing operation function publishes an instruction by the I/O data format specified to the conversion function from the aforementioned motion language to a ladder diagram. The conversion function from the aforementioned motion language to a ladder diagram is attached for interpreting the I / O data of the specified I/O data format. the aforementioned I / O data interpretation function Interpret data by the aforementioned instruction ID, and if the instruction ID of the aforementioned data is a demand of a program counter lead, a program data lead, a program data light, or either of the program counter reset, the received I / O data It is supposed that it is the demand of either specification of each inside. the aforementioned program data interpretation function At the time of the aforementioned specific demand to which a program counter lead or program data lead of each inside, a program data light, or program counter reset of the aforementioned instruction ID corresponds The demand is performed by the aforementioned I / O data interpretation function. the aforementioned user memory I/O function with the aforementioned programmable controller A program counter is led from a programmable controller at the time of the aforementioned specific demand. The data read from the aforementioned programmable controller as response data are created as data to demand data. The aforementioned data ID of the aforementioned response data which take for the aforementioned specific demand at this time In order for the aforementioned response data which made the same as the aforementioned data ID of the aforementioned demand data, and the aforementioned motion language editing operation function received to make it understand the response to which demand data it is The programming method of the programmable controller according to claim 6 characterized by what the created aforementioned response data are published for to the aforementioned motion language editing operation function.

[Translation done.]

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DETAILED DESCRIPTION

[Detailed Description of the Invention]

[0001]

[The technical field to which invention belongs] this invention relates to a means to start the programming equipment and the method of a programmable controller, especially to perform both sequence control and motion control by one usual hardware.

[0002]

[Description of the Prior Art] Conventionally, motion control was possible and the user had described the program in the programmable controller which performs a program by fixed-cycle processing in languages, such as a ladder diagram (LD), an instruction list (IL), and a structure DORAN gage (ST).

[0003]

[Problem(s) to be Solved by the Invention] However, it was very difficult to write the program performed by fixed-cycle processing of a ladder diagram, an instruction list, a structure DORAN gage, etc. for the user who had constructed the program in the conventional technology in the motion language which is the program performed by the instruction step. Moreover, the programmable controller which describes a program in the motion language which is the program performed by the instruction step as the programmable controller which describes a program with a ladder diagram, an instruction list, a structure DORAN gage, etc., and performs a program by fixed-cycle processing as a means perform sequence control in order to perform both sequence control and motion control, and a means perform motion control, and performs a program by the instruction step purchased separately, and the problem of having to develop a program separately was. In here, this invention aims at offering the programming equipment and the method of a programmable controller as a means by which both sequence control and motion control can be performed according to a demand of a user in the programming equipment of one programmable controller.

[0004]

[Means for Solving the Problem] In order to solve the above-mentioned problem, invention of the claim 1 of this invention In the programming equipment of the programmable controller which performs programs, such as a ladder diagram, to a fixed cycle, and has a motor control functional means and user memory A motion language display editing operation means to display the motion language with which a program is performed by the instruction step, and to edit, The I / O data sent from the aforementioned motion language display editing operation means is interpreted. It changes into the language with which a program is performed by fixed cycles, such as a ladder diagram which the aforementioned programmable controller has, from the aforementioned motion language. The aforementioned program is transmitted to the aforementioned programmable controller, and it has the control means which consider read-out of the aforementioned user memory and writing as the aforementioned programmable controller. The conversion functional means from a motion language to a ladder diagram, It is programming equipment of the programmable controller characterized by having a program data storage functional means to have the storage region which memorizes the edited aforementioned program, and the storage region which memorizes the changed program. In the programming equipment of the programmable controller which performs programs, such as a ladder diagram, to a fixed cycle, and has a motor control function and user memory according to this invention in this way An editing operation means to display the motion language with which a program is performed by the instruction step, and to edit, Interpret the I / O data sent from the aforementioned operation means, and it changes into the language with which a program is performed by fixed cycles, such as a ladder diagram which a programmable controller has, from a motion language. The aforementioned program is transmitted to a programmable controller. Read-out of a programmable controller and user memory, Since it had a storage means to have the storage region which memorizes the control means which write in, and the edited program, and the storage region which hears the changed program and to carry out The program means optimal for a user can be chosen by one set of a programmable controller for both sequence control and motion control. moreover, this program equipment An effect special that a means to program in a motion language, without adding reconstruction to the existing programmable controller at the programmable controller itself can be offered] is done so. Furthermore, since the method of programming a motion language becomes the same even when a user uses it with what type of programmable controller by it, when a user programs with the programmable controller of another model, the remarkable effect that it is not necessary to newly master a program is accepted.

[0005] Invention of the claim 2 of this invention is programming equipment of the programmable controller according to claim 1 characterized by the aforementioned I / O data consisting of the I/O data format which consists of Data ID, an instruction type, Instruction ID and data size, and data.

[0006] It is the format to which invention of the claim 3 of this invention changes from the structure of the instruction N which makes the aforementioned program data instruction 0 or the natural number N, and the aforementioned instruction data are

programming equipment of the programmable controller according to claim 2 characterized for it being the format which consists of Data ID, an instruction number, data size, and the structure of data by things.

[0007] Invention of the claim 4 of this invention the conversion functional means from the aforementioned motion language to a ladder diagram The received aforementioned I / O data is interpreted by the aforementioned instruction ID. The I / O data interpretation function to perform processing corresponding to [in the program data interpretation function and the programmable controller / based on the interpreted data] data to the user memory I/O function of a ladder program write-in function and a programmable controller, When the aforementioned instruction ID is program compilation, it performs by the aforementioned I / O data interpretation function. Specification program data are read from the aforementioned program data storage functional means. The program data interpretation function in which make the conversion function from the aforementioned motion language to a ladder diagram perform ladder diagram transform processing, and the data is made to store in the aforementioned program data storage functional means, When the aforementioned instruction ID is program download, it performs by the aforementioned I / O data interpretation function. To the programmable controller which reads specification program data from the aforementioned program data storage functional means, and performs the beginning of a ladder program to the aforementioned programmable controller, a ladder program write-in function, When the aforementioned instructions ID are a program data light and program counter reset It is programming equipment of the programmable controller according to claim 3 characterized by providing the program controller and the user memory I/O function in which it is alike and I/O of the aforementioned program controller and the aforementioned user memory is performed by the aforementioned I / O data interpretation function.

[0008] Invention of the claim 5 of this invention the structure of the ladder diagram after compile of the conversion function from the aforementioned motion language to a ladder diagram Motion data processing to which processing set in order to be in the 1st of periodic processing and to use the data of a servo control etc. by the next motion control processing is carried out, It is in the 2nd of periodic processing. The ladder diagram of the compile result of the motion language program which users, such as a position, a speed detection, etc. symmetrical with control from the aforementioned motion data processing, created, and the 1st motion control processing which performs processing which creates the data used by the further motion control processing, Are in the 3rd of periodic processing and consist of sets of two or more instructions surrounded considering the program counter as conditional statement, and at the time of execution, a period is straddled until only the instruction of the value of a program counter is executed and execution is completed. The ladder diagram by which processing of the same program counter is performed, The 2nd motion control processing which creates the aforementioned user data outputted to the aforementioned servo control which is in the 4th of periodic processing and performs actual motion control, Are in the 5th of periodic processing and it is based on the execution data of motion control processing of the above 2nd. It is programming equipment of the programmable controller according to claim 4 characterized by consisting of the motion data output processing which outputs required motion data to the aforementioned servo control.

[0009] The diagram of the compile result of the aforementioned motion language program to which the aforementioned user created invention of the claim 6 of this invention The ladder as which it consists of meetings of a block of the ladder program which surrounded the aforementioned program counter by the conditional expression which consists of conditional statement, and the ladder program in the aforementioned conditional expression expresses a part for each instruction for each aforementioned program counter, When it consists of conditional statement which supervises completion of an instruction and completion of an instruction becomes truly, the aforementioned program counter is programming equipment of the programmable controller according to claim 5 characterized by making it change to the next instruction.

[0010] Invention of the claim 7 of this invention has a motor control functional means and user memory. by and the aforementioned motion language display editing operation means Perform programs, such as a ladder diagram, to a fixed cycle, and it sets for the conversion functional means from a motion language to a ladder diagram. If the motion language with which a program is performed is displayed and edited by the instruction step The I / O data sent from the aforementioned motion language display editing operation means is interpreted. It changes into the language with which a program is performed by fixed cycles, such as a ladder diagram which the aforementioned programmable controller has, from the aforementioned motion language. It is the programming method of the programmable controller characterized by what the aforementioned program is transmitted to the aforementioned programmable controller, and read-out of the aforementioned programmable controller and the aforementioned user memory and write-in control are performed for.

[0011] Invention of the claim 8 of this invention the aforementioned motion language editing operation function An instruction is published by the I/O data format specified to the conversion function from the aforementioned motion language to a ladder diagram. The conversion function from the aforementioned motion language to a ladder diagram It attaches for interpreting the I / O data of the specified I/O data format. the aforementioned I / O data interpretation function Interpret the received aforementioned I / O data by the aforementioned instruction ID, and if the instruction ID of the aforementioned data is a program compilation demand, the aforementioned program data interpretation function When the aforementioned instruction ID is program compilation, it performs by the I / O data interpretation function. the aforementioned program data interpretation function Specification program data are read from the aforementioned program data storage function. The conversion function from the aforementioned motion language to a ladder diagram is made to perform ladder program transformation processing. the conversion function from the aforementioned motion language to a ladder diagram It is the programming method of the programmable controller according to claim 6 characterized by changing into a separate ladder program for every aforementioned instruction ID, and storing the data in the aforementioned program data storage function based on a program data structure format.

[0012] In invention of the claim 9 of this invention, the aforementioned motion language editing operation function publishes an instruction by the I/O data format specified to the conversion function from the aforementioned motion language to a ladder diagram. The conversion function from the aforementioned motion language to a ladder diagram is attached for interpreting the I / O data of the specified I/O data format. the aforementioned I / O data interpretation function Interpret data by the aforementioned instruction ID, and if the instruction ID of the aforementioned data is a demand of a program counter lead, a program data lead, a program data light, or either of the program counter reset, the received I / O data It is supposed that it is the demand of either specification of each inside. the aforementioned program data interpretation function At the time of the aforementioned specific demand to which a program counter lead or program data lead of each inside, a program data light, or program counter reset of the aforementioned instruction ID corresponds The demand is performed by the aforementioned I / O data interpretation function. the aforementioned user memory I/O function with the aforementioned programmable controller A program counter is led from a programmable controller at the time of the aforementioned specific demand. The data read from the aforementioned programmable controller as response data are created as data to demand data. The aforementioned data ID of the aforementioned response data which take for the aforementioned specific demand at this time In order for the aforementioned response data which made the same as the aforementioned data ID of the aforementioned demand data, and the aforementioned motion language editing operation function received to make it understand the response to which demand data it is It is the programming method of the programmable controller according to claim 6 characterized by what the created aforementioned response data are published for to the aforementioned motion language editing operation function.

[0013]

[Embodiments of the Invention] Hereafter, the gestalt of operation of this invention is explained based on drawing. In all drawings, a considerable member is shown and the same sign's being the same or the arrow further inscribed on the informational path expresses the informational transfer direction. The gestalt of this operation is explained taking the case of [one] the ladder diagram as a program means of the program performed by the fixed cycle. Drawing 1 is the block diagram showing the outline of the whole equipment of this invention. The servo control [equipment / programming / of a programmable controller] by which 1 is controlled and a programmable controller and 3 are controlled for 2 from a programmable controller, and 4 are servo motors controlled from a servo control. A servo motor 4 is controlled by instructions of a servo control 3. A servo control 3 is controlled by instructions of a programmable controller 2. A programmable controller 2 publishes instructions to a servo control 3 based on the program described by the ladder diagram. A program is transmitted to a programmable controller 2 from programming equipment 1, and it operates based on it. Moreover, the input/output request of the user data from program equipment 1 also performs a programmable controller 2. By this invention, the equipment which performs the program described in the motion language by step instruction is realized by adding programming equipment 1, without adding change to a programmable controller 2, a servo control 3, and a servo motor 4 entirely. Therefore, the following explanation is given centering on programming equipment 1.

[0014] Drawing 2 is the circuitry view of the programming equipment of this invention. As for a motion language editing operation function and 23, 22 is [a program data storage function and 24] the conversion functions from a motion language to a ladder diagram. That is, programming equipment 1 is constituted by the motion language editing operation function 22, the program data storage function 23, and the conversion function 24 from a motion language to a ladder diagram. The motion language editing operation function 22 offers the motion program operation to a user, a display, and an execution monitor, and stores them by the program format to which the motion language program which the user created was specified by the program data storage function 23. Moreover, the motion language editing operation function 22 publishes an instruction by the I/O data format specified to the conversion function 24 from a motion language to a ladder diagram. The conversion function 24 from a motion language to a ladder diagram interprets the I / O data of the specified I/O data format, and performs program compilation, download, lead of a program counter, and read/write of user data.

[0015] Drawing 3 is drawing showing the I/O data format which this invention specifies. For Data ID and 33, as for Instruction ID and 35, an instruction type and 34 are [31 / an I/O data format and 32 / data size and 36] data. Thus, the I/O data format 31 is constituted by data ID 32, the instruction type 33, instruction ID 34, the data size 35, and data 36. Data ID 32 are uniquely assigned to each demand data, in order that the motion language editing operation function 22 may distinguish the response data to the demand data from the conversion function 24 from a motion language to a ladder diagram. It distinguishes whether the demand data is a lead demand and whether the instruction type 33 is a light demand. If it is a lead demand, the response data to the demand will surely come on the contrary. In instruction ID 34, they are program compilation 341, the program download 342, the program counter lead 343, the program data lead 344, the program data light 345, and the program counter reset 346. It is. By Instruction ID, the conversion function 24 from a motion language to a ladder diagram determines the method of an interpretation of data. The data size 35 expresses the size of the data of data 36. The content of data 36 is determined for every instruction ID.

[0016] Drawing 4 is drawing showing the program data format which this invention specifies, and is (a). A program data structure format and (b) It is drawing showing an instruction data structure format. That is, drawing 3 is drawing showing the format of an instruction, and, for drawing 4, the instruction ID of drawing 3 is 341. It is drawing which displays the detail of the data 36 of a case. For an instruction data structure format and 43, as for an instruction number and 45, Data ID and 44 are [41 / a program data structure format and 42 / data size and 46] data. The program data structure format 41 consists of arrays of the instruction data structure format 42. The instruction data structure format 42 consists of data ID 43, an instruction number 44, data size 45, and data 46. Data ID 43 are [program data structure] under format, and are surely unique. As for the branching place by conditional statement etc., a branching place is expressed by data ID 43. To the instruction number 44, change

dynamics (Change Dynamics), A home axis (Home Axis) and a MUBU axis (Move Axis), GYARESHIO (Gear Ratio), a jog axis (Jog Axis), Scale SHIEIEMU (Scale CAM) and SHIEI em-on/OFF (CAM On/Off), Servo-on/OFF (Servo On/Off), an abort motion (Abort Motion), Gearing-on/OFF (Gearing On/Off) and a reset fault (Reset Fault), A DEFA in position (Define Position) and an increment position (Increment Position), Latch-on/OFF (Latch On/Off), a latch target (Latch Target), The Ife vent (If Event) and an on-time (On Time), A restart program (Restart Program) and a start (Start), IFUFORUTO (IfFault) and a suspension program (Suspend Program), And (End) message out (Message Out), There is a message in (Message In), set variable (Set Variable), programmable limit switch (Programmable Limit Switch), and call block (Call Block). The transformation rule from a motion language to a ladder diagram are decided by the instruction number. The data size 45 expresses the size of the data of data 46. The content of data 46 is determined for every instruction number.

[0017] Drawing 5 is the block diagram also including the circumference circuit of the function to realize the step execution method of a motion language which uses a ladder diagram by the conversion function from the motion language of this invention to a ladder diagram showing circuitry. 24 -- for a I / O data interpretation function and 53, as for the conversion function from a motion language to a ladder diagram, and 55, a program data interpretation function and 54 are [the conversion function from a motion language to a ladder diagram, and 52 / a ladder program write-in function and 56] user memory I/O functions with a programmable controller in a programmable controller. The conversion function 24 from a motion language to a ladder diagram consists of a ladder program write-in function 55 and a user memory I/O function 56 with a programmable controller to the I / O data interpretation function 52, the program data interpretation function 53, the conversion function 54 from a motion language to a ladder diagram, and a programmable controller. The I / O data interpretation function 52 interprets the received I / O data by instruction ID 34. The I / O data interpretation function 52 makes the ladder program write-in function 55 and the user memory I/O function 56 with a programmable controller perform processing corresponding to data to the program data interpretation function 53 or a programmable controller based on the interpreted data. The program data interpretation function 53 is performed by the I / O data interpretation function 52, when instruction ID 34 is 1 (program compilation). The program data interpretation function 53 reads specification program data from the program data storage function 23, makes the conversion function 54 from a motion language to a ladder diagram perform ladder program transformation processing, and stores the data in it at the program data storage function 23.

[0018] The ladder program write-in function 55 is performed by the I / O data interpretation function 52 to a programmable controller, when instruction ID 34 is 342 (program download). The ladder program write-in function 55 reads specification program data from the program data storage function 23 to a programmable controller, and performs the beginning of a ladder program to a programmable controller to it. The user memory I/O function 56 with a programmable controller is performed by the I / O data interpretation function 52, when instructions ID 34 are 343 (program counter lead), 344 (program data lead), 345 (program data light), and 346 (program counter reset). For the user memory I/O function 56 with a programmable controller, instruction ID 34 is 343. At the time, a program counter is led from a programmable controller. For the user memory I/O function 56 with a programmable controller, instruction ID 34 is 344. At the time, specification program data are led from a programmable controller. Instruction ID 34 is 345. At the time, the light of the specification program data is carried out to a programmable controller. Instruction ID 34 is 346. At the time, it is a program counter 341 It writes in and processing is returned to the first instruction.

[0019] Moreover, the function depending on a programmable-controller kind To the conversion function 54 from a motion language to a ladder diagram, and a programmable controller, since it is only three functions of the ladder program write-in function 55 and the user memory I/O function 56 with a programmable controller By creating three functions of the ladder program write-in function 55 and the user memory I/O function 56 with a programmable controller for every programmable-controller kind to the conversion function 54 from a motion language to a ladder diagram, and a programmable controller To a user, it becomes possible to completely offer the motion language editing operation function 22 which is the same operating environment. Since the operating instruction of a motion program function can become eternal according to the structure of this function even if a programmable controller changes, it becomes unnecessary to master the operating instruction of a new motion program function even if a programmable controller changes for a user, and one set of a programmable controller can perform both sequence control and motion control, it becomes unnecessary to purchase separately the programmable controller which supports a ladder diagram, and the programmable controller which supports a motion language.

[0020] Drawing 6 is drawing showing the composition of the whole ladder diagram after compile of the conversion function from the motion language of this invention to a ladder diagram. As for the ladder diagram program of the compile result of the motion language program to which the 1st motion control processing created motion data input processing and 63, and the user created [61] 64 for the ladder diagram structure after the conversion in a ladder diagram from a motion language, and 62, and 65, the 2nd motion control processing and 66 are motion data output processings. The ladder diagram structure 61 after the conversion in a ladder diagram from a motion language is constituted by the motion data input processing 62, the 1st motion control processing 63, the ladder diagram program 64 of the compile result of the motion language program which the user created, the 2nd motion control processing 65, and the motion data output processing 66. The motion data input processing 62 is located in the beginning of periodic processing. The processing which sets in order that the motion data input processing 62 may use the data of a servo control 3 etc. for the 1st motion control processing 63 is described. The 1st motion control processing 63 is located in the 2nd of periodic processing.

[0021] The 1st motion control processing 63 performs processing which creates the data used by the ladder diagram program 64 of the compile result of the motion language program which users, such as a position and a speed detection, created, and the 2nd motion control processing 65. The ladder diagram program 64 of the compile result of the motion language program which the

user created is located in the 3rd of periodic processing. The ladder diagram program 64 of the compile result of the motion language program which the user created consists of sets of two or more instructions surrounded as conditional statement in a program counter. Only the instruction of the value of a program counter is executed at the time of execution. Ranging over a period, processing of the same program counter is performed until execution is completed. Here, actual motion control is not performed but the user data for outputting to a servo control 3 by the 2nd motion control processing 65 is created. The 2nd motion control processing 65 is located in the 4th of periodic processing. This 2nd motion control processing 65 performs processing which outputs a control parameter to a servo control based on the user data set up by the ladder diagram program 64 of the compile result of the motion language program which the user created. The motion data output processing 66 outputs required motion data based on the execution data of the 2nd motion control processing 65.

[0022] Drawing 7 is the block diagram of the ladder diagram program of the compile result of the motion language program which the user created. 71 is the ladder diagram program of the compile result of the motion language program which the user created. The ladder diagram program 71 of the compile result of the motion language program which the user created consists of meetings of a block of the ladder program which surrounded the program counter by conditional expression. It consists of a ladder to which the DAPU log ram in conditional expression realizes each instruction for the program counter of each of, and conditional statement which supervises completion of an instruction. If completion of an instruction becomes truly, a program counter will change to the next instruction.

[0023] The example in the gestalt of this operation of this invention by which program compilation is carried out is explained based on the flow chart of drawing 8. The motion language editing operation function 22 publishes an instruction by the I/O data format specified to the conversion function 24 from a motion language to a ladder diagram. (Step 801). The conversion function 24 from a motion language to a ladder diagram interprets the I/O data of the specified I/O data format. (Step 802). In the conversion function 24 from a motion language to a ladder diagram, the I/O data interpretation function 52 interprets the received I/O data by instruction ID 34. the instruction ID 34 of data -- 341 it is -- if -- it is a program compilation demand (it is YES at Step 802). The program data interpretation function 53 is performed by the I/O data interpretation function 52, when instruction ID 34 is 1 (program compilation). that is, the program data with which the program data interpretation function 53 was specified from the program data storage function 23 -- reading -- (Step 803) The conversion function 54 from a motion language to a ladder diagram is made to perform ladder program transformation processing (Step 804). The conversion function 54 from a motion language to a ladder diagram Program data structure format [refer to drawing 4 (b)] It is based and changes into a separate ladder program every instruction number 44. (Step 806,807) The data is stored in the program data storage function 23. (Step 808,809).

[0024] The example by which a monitor is carried out in the program execution step in the gestalt of this operation of this invention is explained based on the flow chart of drawing 9. The motion language editing operation function 22 publishes an instruction by the I/O data format specified to the conversion function 24 from a motion language to a ladder diagram. (Step 901). The conversion function 24 from a motion language to a ladder diagram interprets the I/O data of the specified I/O data format. (Step 902). In the conversion function 24 from a motion language to a ladder diagram, the I/O data interpretation function 52 interprets the received I/O data by instruction ID 34. the instruction ID of data -- 343 it is -- if -- it is a program counter lead demand The program data interpretation function 53 is performed by the I/O data interpretation function 52, when instructions ID 34 are 343 (program counter lead), 344 (program data lead), 345 (program data light), and 346 (program counter reset). For the user memory I/O function 56 with a programmable controller, instruction ID 34 is 343. At the time, a program counter is led from a programmable controller. (Step 903). The data read from the programmable controller as response data are created as data to demand data. (Step 904). At this time, the data ID 32 of response data are made the same as the data ID 32 of demand data. The motion language editing operation function 22 is for the received response data to understand the response to which demand data it is. The created response data are published to the motion language editing operation function 22. (Step 905,906).

[0025] The example which carries out the monitor of the variable of the program in the gestalt of this operation of this invention is explained based on the flow chart of drawing 10. The motion language editing operation function 22 publishes an instruction by the I/O data format specified to the conversion function 24 from a motion language to a ladder diagram. (Step 101). The conversion function 24 from a motion language to a ladder diagram interprets the I/O data of the specified I/O data format. (Step 102). In the conversion function 24 from a motion language to a ladder diagram, the I/O data interpretation function 52 interprets the received I/O data by instruction ID 34. the instruction ID of data -- 344 it is -- if -- it is a program data lead demand The program data interpretation function 53 is performed by the I/O data interpretation function 52, when instructions ID 34 are 343 (program counter lead), 344 (program data lead), 345 (program data light), and 346 (program counter reset). (Step 103). For the user memory I/O function 56 with a programmable controller, instruction ID 34 is 344. At the time, program data are led from a programmable controller. The data read from the programmable controller as response data are created as data to demand data. (Step 104). At this time, the data ID 32 of response data are made the same as the data ID 32 of demand data. The motion language editing operation function 22 is for the received response data to understand the response to which demand data it is. The created response data are published to the motion language editing operation function 22. (Step 105,106). Thus, when the instruction ID in the I/O data format of this invention is the program compilation of 341, it is processed corresponding to the flow chart of drawing 8, and it is 343,344, other Cases ID, for example, instruction. At the time, they are processed corresponding to the flow chart [thing mentioned above / drawing 9 and drawing 10 / the flow chart].

[0026]

[Effect of the Invention] In the programming equipment of the programmable controller which according to this invention

performs programs, such as a ladder diagram, to a fixed cycle, and has a motor control function and user memory as a full account was given above. An editing operation means to display the motion language with which a program is performed by the instruction step, and to edit. Interpret the I / O data sent from the aforementioned operation means, and it changes into the language with which a program is performed by fixed cycles, such as a ladder diagram which a programmable controller has, from a motion language. The aforementioned program is transmitted to a programmable controller. Read-out of a programmable controller and user memory, Since it had a storage means to have the storage region which memorizes the control means which write in, and the edited program, and the storage region which memorizes the changed program. The program means optimal for a user can be chosen by one set of a programmable controller for both sequence control and motion control. moreover, this program equipment. An effect special [that a means to program in a motion language, without adding reconstruction to the existing programmable controller at the programmable controller itself can be offered] is done so. Furthermore, since the method of programming a motion language becomes the same even when a user uses it with what type of programmable controller by it, when a user programs with the programmable controller of another model, the remarkable effect that it is not necessary to newly master a program is accepted.

[Translation done.]

*** NOTICES ***

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1. This document has been translated by computer. So the translation may not reflect the original precisely.
2. **** shows the word which can not be translated.
3. In the drawings, any words are not translated.

DESCRIPTION OF DRAWINGS

[Brief Description of the Drawings]

- [Drawing 1] Drawing showing the composition of the whole equipment of this invention
- [Drawing 2] The block diagram showing the composition of the programming equipment of this invention
- [Drawing 3] Drawing showing the I/O data format which this invention specifies
- [Drawing 4] The program data format which this invention specifies is shown, and it is (a). Drawing of a program data structure format, and (b) Drawing of an instruction data structure format
- [Drawing 5] The block diagram of a function which realizes the step execution method of the motion language using a ladder diagram by the conversion function from the motion language which becomes this invention to a ladder diagram
- [Drawing 6] Drawing showing the composition of the whole ladder diagram after compile of the conversion function from the motion language in this invention to a ladder diagram
- [Drawing 7] Drawing showing the composition of the ladder diagram program after compile of the motion language program which the user created by this invention
- [Drawing 8] The flow chart showing an example in this invention by which program compilation is carried out
- [Drawing 9] The flow chart showing an example by which a monitor is carried out in the program execution step in this invention
- [Drawing 10] The flow chart showing an example which carries out the monitor of the variable (program data) of the program in this invention

[Description of Notations]

- 1 Motion Program Equipment of Programmable Controller
- 2 Programmable Controller
- 3 Servo Control Controlled from Programmable Controller
- 4 Servo Motor Controlled from Servo Control
- 22 Motion Language Editing Operation Function
- 23 Program Data Storage Function
- 24 Conversion Function from Motion Language to Ladder Diagram
- 31 I/O Data Format
- 32 (I/O Data Format) Data ID
- 33 Instruction Type
- 34 Instruction ID
- 35 (I/O Data Format) Data Size
- 36 (I/O Data Format) Data
- 41 Program Data Structure Format
- 42 Instruction Data Structure Format
- 43 (Instruction Data Structure Format) Data ID
- 44 Instruction Number
- 45 (Instruction Data Structure Format) Data Size
- 46 (Instruction Data Structure Format) Data
- 52 I / O Data Interpretation Function
- 53 Program Data Interpretation Function
- 54 Conversion Function from Motion Language to Ladder Diagram
- 55 Ladder-Program-Writing-Function to Programmable Controller.
- 56 User Memory I/O Function with Programmable Controller
- 61 (Conversion-in Ladder Diagram Back from Motion Language) Ladder Diagram Structure
- 62 1st Motion Data Input Processing
- 63 Motion Control Processing
- 64 Ladder Diagram Program of Compile Result of Motion Language Program Which User Created
- 65 2nd Motion Control Processing
- 66 Motion Data Output Processing
- 71 (Compile Result of Motion Language Program Which User Created) Ladder Diagram Program

* NOTICES *

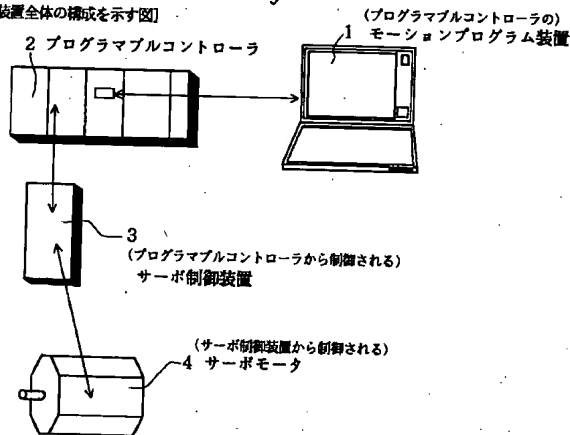
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3. In the drawings, any words are not translated.

DRAWINGS

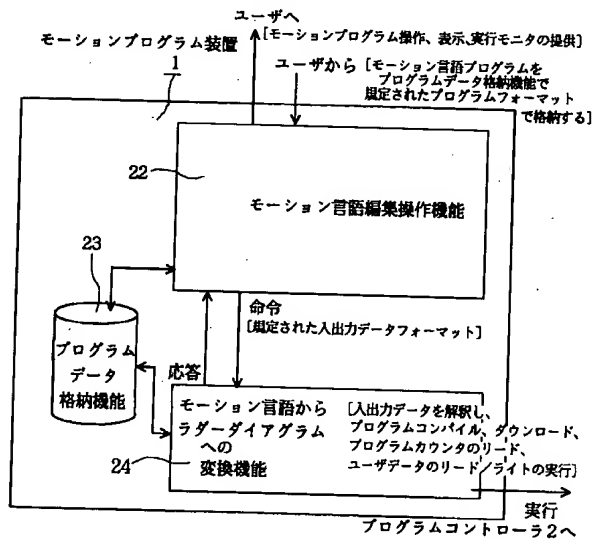
[Drawing 1]

[本発明の装置全体の構成を示す図]



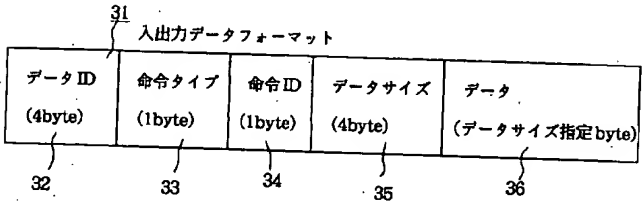
[Drawing 2]

[本発明のプログラミング装置の構成を示すブロック図]



[Drawing 3]

[本発明が規定する入出力データフォーマットを示す図]
(モーション言語編集機能22から モーション言語からラダーダイアグラムへの変換機能24へ与えられる)



但し、

データIDは、
0～4294967295の数字である。

命令タイプは、
331はライト要求、
332はリード要求である。

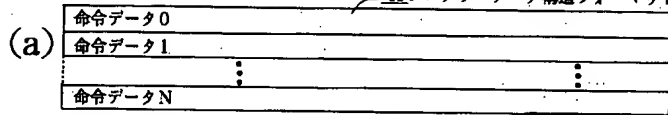
命令IDは、
341はプログラム コンパイル、
342はプログラム ダウンロード、
343はプログラムカウンタ リード、
344はプログラムデータ リード、
345はプログラムデータ ライト、
346はプログラムカウンタ リセットである。

データ (データサイズ) は、
0～4294967295の数字である。

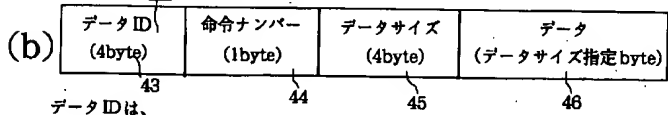
[Drawing 4]

[本発明が規定するプログラムデータフォーマットを示す図]

41 プログラムデータ構造フォーマット



42 命令データ構造フォーマット



データ ID は、
0～4294967295 の数値である。

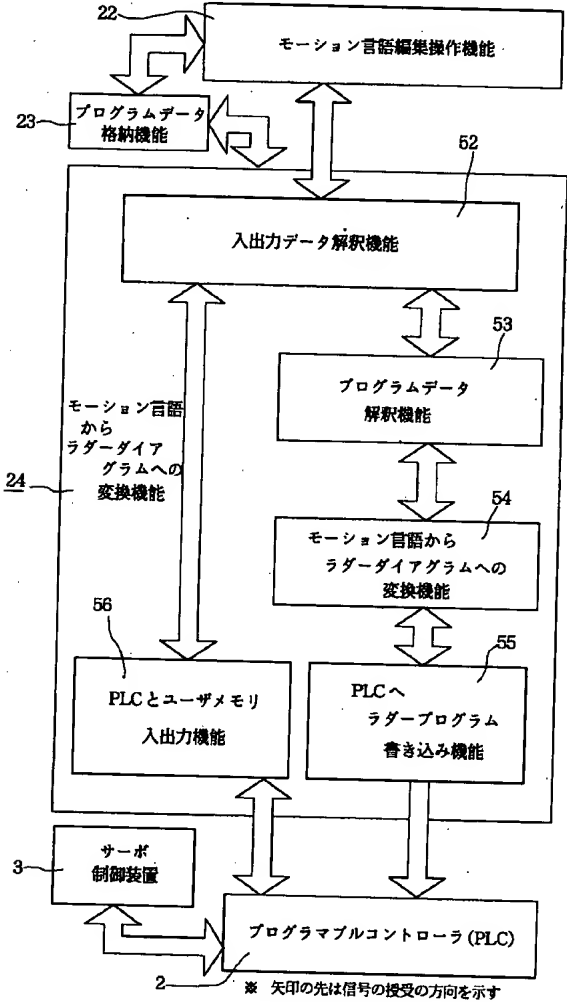
命令 ID は次に示す表の通りである。

Block Group	命 令	命令 ナン バー	説 明	Block Group	命 令	命令 ナン バー	説 明
Motion	Change Dynamic	0	移動速度、加速度などを変更する	Logic	If Event	15	指定条件文の真偽で処理を分岐
Motion	Home Axis	1	ホームポジションに戻る	Logic	On Time	16	指定時間のタイマアウトで処理分岐
Motion	Move Axis	2	移動速度、加速度で指定方法で移動する	Logic	Restart Program	17	プログラムの再実行
Motion	Gear Ratio	3	ギア比の設定	Logic	Start	18	スタート
Motion	Jog Axis	4	ジョグ	Logic	If Fault	19	サーボがエラーを起こすと処理分岐
Motion	Scale CAM	5	電子CAMの実行方法指定	Logic	Suspend Program	20	プログラムの一時停止
Motion	CAM On/Off	6	電子CAMの実行/停止	Logic	End	21	エンド
Motion	Servo On/Off	7	サーボのON/OFF	Comm	Message Out	22	ユーザデータ出力
Motion	Abort Motion	8	指定方法でモータ停止	Comm	Message In	23	ユーザデータ入力
Motion	Gearing On/Off	9	ギアの実行/停止	Misc	Set Variable	24	C言語風の計算式処理
Control	Reset Fault	10	サーボのエラーリセット	Misc	Programmable Limit Switch	25	ソフトリミットスイッチ
Control	Define Position	11	位置オフセット変更	Misc	Call Block	26	サブルーチンコール
Control	Increment Position	12	位置を増分				
Control	Latch On/Off	13	ラッチ実行				
Control	Latch Target	14	ラッチの設定				

データサイズは、
0～4294967295 の数値である。

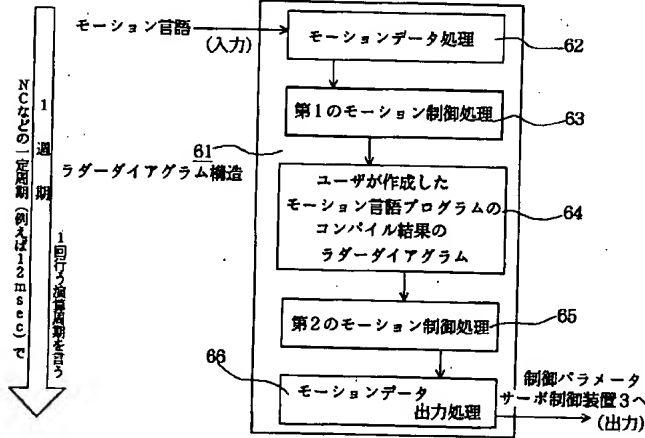
[Drawing 5]

[本発明になるモーション言語からラダーダイアグラムへの変換機能におけるラダーダイアグラムを用いてのモーション言語のステップ実行方式を実現する機能を示すブロック図]



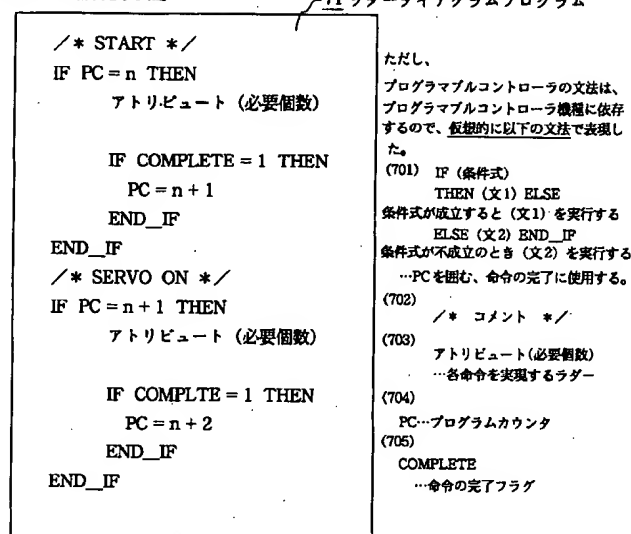
[Drawing 6]

[本発明におけるモーション言語からラダーダイアグラムへの変換機能のコンパイル後におけるラダーダイアグラム全体の構成を示す図]



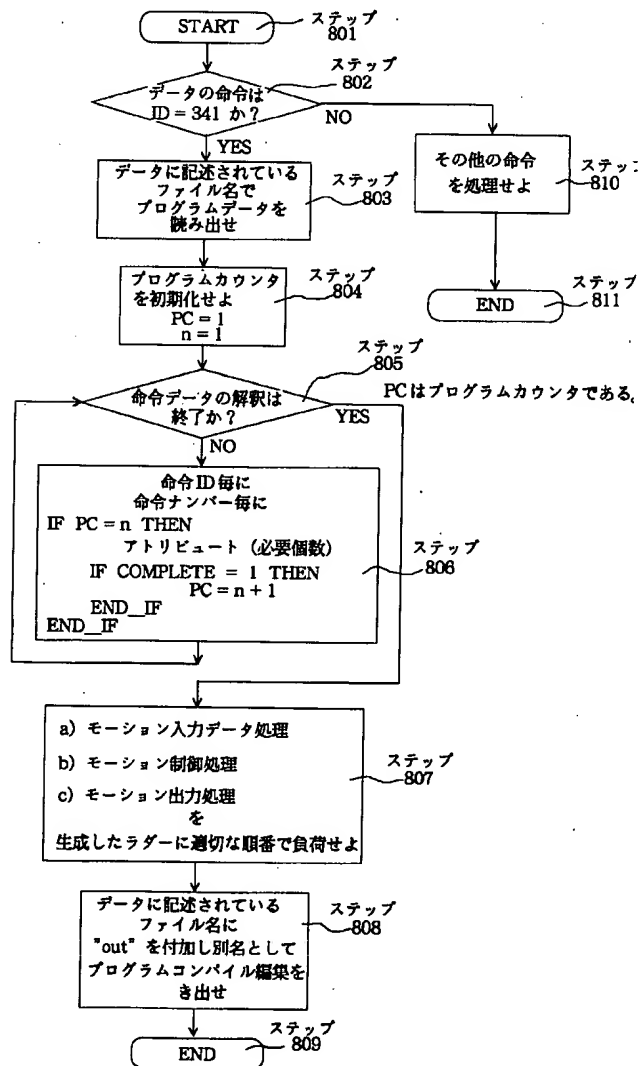
[Drawing 7]

[本発明でユーザが作成したモーション言語プログラムのコンパイル後のラダーダイアグラムプログラムの構成を示す図]



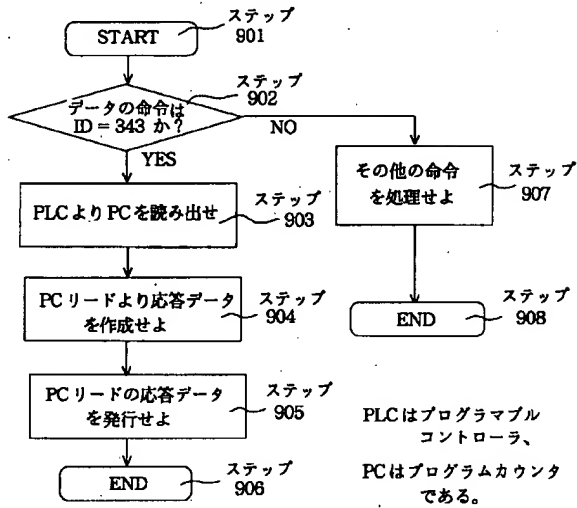
[Drawing 8]

[本発明におけるプログラムコンパイルされる一例を示す図]



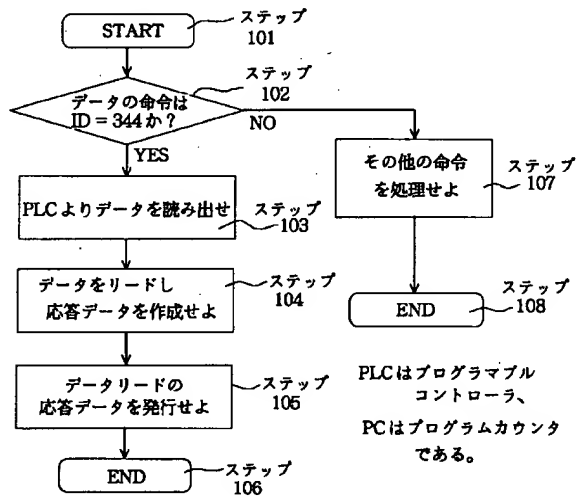
[Drawing 9]

[本発明におけるプログラムの実行ステップをモニタされる一例を示す図]



[Drawing 10]

[本発明におけるプログラムの変数（プログラムデータ）をモニタする一例を示す図]



[Translation done.]